PG 152

KAY ELECTRIC CO.

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SECTION I

GENERAL INFORMATION

1.1. INTRODUCTION

The Model PC-152 sweep plug-in is compatible with Kay sweeping oscillator units, such as, the Marka-Sweep Model Pi and Vari-Sweep 860. The P-152 sweep head is a beat frequency scillator which provides clean, stable sweeps from 10 kc to 20 mc.

Two switched sweep width ranges are available providing optimum stability at the required sweep. These are continuously varialbe to 2 mc or 20 mc. Any protion of the 10 kc to 20 mc range can be swept in a centered sweep, and sweep width can be either linear or logarithmic at all rep rates.

Oscillator output is adjustable to 1 volt rms into 50 ohms (70 ohms, if ordered). Center frequency is indicated on a digital dial calibrated from 0 to 10 mc.

A separate AUX RF Out jack provides a means of coupling out a tapped--down swept r-f voltage to drive a marker genreator plug-in such as Kay PCM- 7631, PCM-7632 or PCM8 (These marker plug-in heads are compatible with Kay Model Pi sweeping oscillator and marker generator basic rack unit.) When the PC-152 sweep head is used in the Kay Vari-Sweep Model 860-H swoping oscillator rack unit, the swept r-f voltage may be coupled to an external frequency marker genreator, such as the Kay Vari-Marker Model F, which provides up to 40 crystal-controlled, pulse-type frequency markers.

Internal marker pips, which appear as negative notches on the detected sweep envelope may be developed when the PC-152 sweep head is used in conjunction with PMC 932B marker head. This type of marker is useful for making vidow tape, and for transmission of marker data over long-line cables.

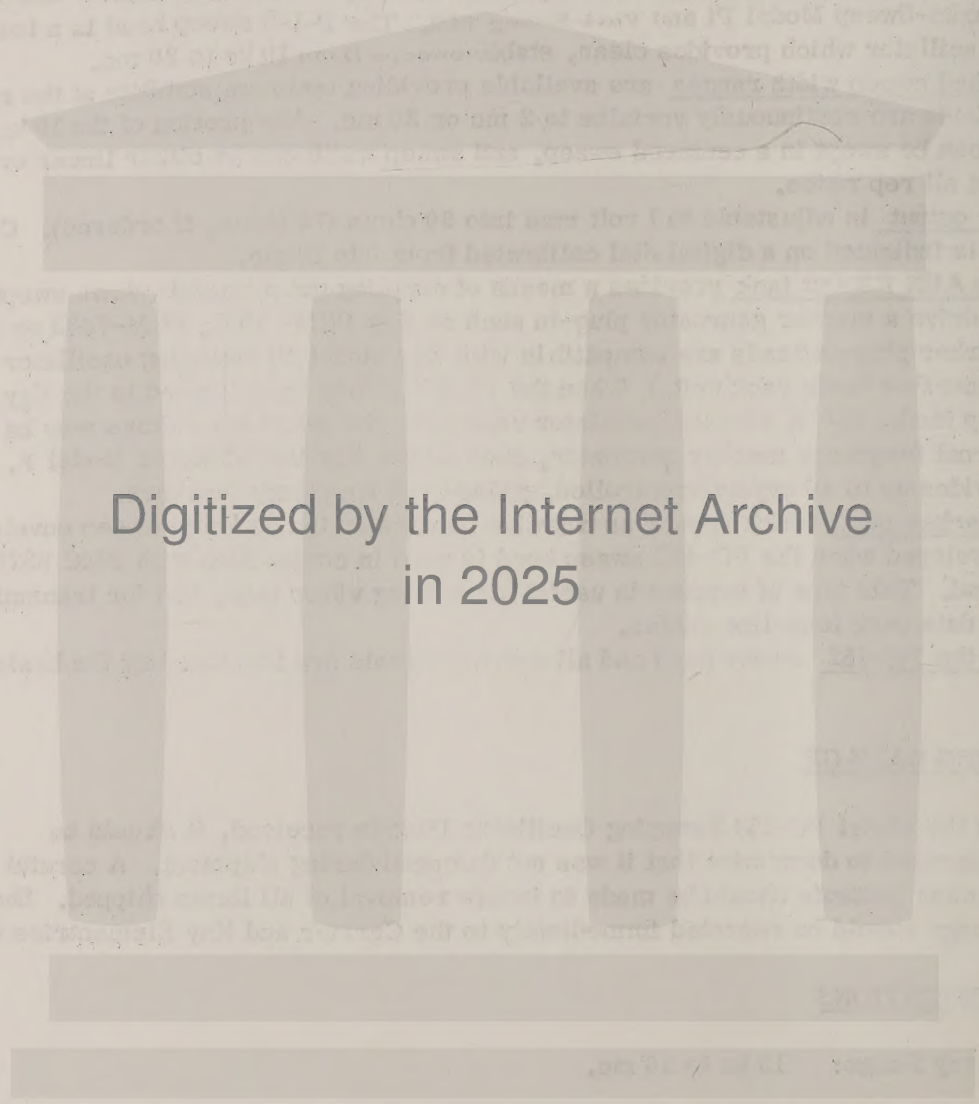
Power for the PC-152 sweep head and all driving signals are furnished by the basic rack unit.

1.2 SHIPPING DAMAGE

As soon as the Model PC-152 Sweeping Oscillator Plug-in received, it should be visually inspected to determine that it was not damaged during shipment. A careful check of packing case contents should be made to insure removal of all items shipped. Shortage or damage should be reproted immediately to the Carrier and Kay Elementrics Corp.

1.3. SPECIFICATIONS

Frequency Range:	10 kc to 20 mc.
Output:	1 volt rms into 50 ohms (70 ohms, if ordered)
Flatness:	+.5db over widest sweep.



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Sweep Width:	2 switched ranges variable to 2 mc or 20 mc; continuously variable within each range. Either linear or logarithmic sweeps at all repetition rates and sweep widths.
Power Input:	All power and driving signals are furnished by the basic rack unit.
Dimensions:	6" h x 7½" x 10" d
Weight:	6 lbs.

SECTION II

OPERATION

2.1 INTRODUCTION

General operating instructions are furnished in the instruction manual provided with the basic rack unit(s) in which this sweep plug-in head may be used. Specific identification and function of only those controls and terminals physically located on the plug-in head are discussed here. Since these controls and terminals have a direct relationship to those on the basic rack, both manuals should be referred to.

Installation of PC-152A sweep plug-in in the rack unit is accomplished by pushing the plug-in into the receiving well as far as it will go. To lock the plug-in in place, turn the locking screw clockwise until it is tight. The plug-in may be removed from the rack unit by turning the locking screw counterclockwise to release it from the rack, and pulling the plug-in free.

2.2 CONTROLS AND TERMINALS (Front Panel).

CONTROL	POSITION	FUNCTION
SWEEP WIDTH Switch S-4	2 mc 20 mc	Permits selection of sweep ranges or widths. The Sweep Width control on the rack unit adjusts sweep width within the ranges.
LIN-LOG Switch S-3	LIN LOG	Depending on the position of this switch, either linear or logarithmic sweeps will be gen-rated
FREQUENCY MEGACYCLES R-19	DIGITAL DIAL	Calibrated in frequency from 0 to 10 mc and indicates center frequency. (Dependent on setting on READ DIRECT - ADD 10 MC switch).
READ DIRECT ADD 10 MC Switch S-5	READ DIRECT- ADD 10 MC	Determines the output frequency indicated by FREQUENCY MEGACYCLES control.
CENTERING Control R-21	Variable	Used to make small center frequency adjustment to calibrate Frequency Megacycles dial.
AGC SPEED Switch S-1	FAST SLOW	Provides optimum flatness above 100 kc. Provides optimum flatness over the entire frequency range.

TERMINAL	
AUX RF OUT Jack J-2	A position of swept r-f output is available her, and is normally patched to Marker RF IN jack on Marker Plug-in unit.

2.3 INTERNAL CONTROLS AND TERMINALS

CONTROL	POSITION	FUNCTION
SWP CAL ADJ R-41	Variable	Calibration of the CENTER FREQUENCY dial.
10 MC ADJ R-91	Variable	Calibration of the CENTER FREQUENCY dial.
SWEEP LIN-EARITY Network R25, 26, 28, 29, 33, 34, 35, 36	Variable	Adjust the frequency linearity with respect to the horizontal sweep time of the swept RF Output. Also affects dial calibration.
AGC ADJ R-83	Variable	Limits gain of the AGC amplifiers to provide maximum flatness.
LEVEL ADJ R-88	Variable	Adjustment for 1.0 V RMS output at the RF OUTPUT jack on the basic rack unit.
METER ADJ R-88	Variable	Adjustment for a 1.0 V RMS meter reading when the RF output is determined to be 1.0 V RMS.

TERMINAL	
RF OUT Jack J-2	Swept RF is available here and is patched to input connector on step attenuator in basic rack unit.

SECTION III

CIRCUIT DESCRIPTION

3.1 OVERALL CIRCUIT DESCRIPTION

The major circuits of the P-152A Sweep Head consist of a sawtooth shaper, high and low frequency sweeping oscillators, balanced modulator, low pass filter and output amplifier. The relationship of these circuits is shown in Fig. 3-1.

For LIN SWP operation the sawtooth voltage developed in the rack is applied to SWP differential amplifiers Q3 and Q4. In the LOG SWP MODE the sawtooth is amplified and shaded and then applied to the swp differential amplifiers.

SECTION IV

ALIGNMENT PROCEDURE P-152A

4.1 EQUIPMENT

VTVM
Oscilloscope
Utilator

Voltage Calibrated Detector (with provisions for mixing CW marker signal).
Harmonic Marker Generator
2 mc CW Generator
10 kc & 200 kc Absorption Type Wave Traps

4.2 POWER SUPPLIES:

a. Check +30, -30, +150, and +62 V and -22 V supply voltages.

4.2 SWEEPING OSCILLATOR FREQUENCY ADJUSTMENT

a. Set linearity pots as follows:
   1) Max Clockwise - R25, R26, R33, R34, R35.
   2) Max Counter Clockwise - R28, R36
b. Set following pots to Mid Range: "Centering," "10 mc Adj," "Swp Bal," "Blanking Adj," "AGC Adj," "Meter Adj," "Level Adj,"; set LOG/LIN switch to "LIN."
c. Set SWEEP SELECTOR to MAN SWP.
   Set SWEEP WIDTH control counter-clockwise (min. sweep width).
   Set SWEEP WIDTH switch to "2 mc".
   Set FREQUENCY DIAL switch to READ DIRECT.
   Set FREQUENCY MEGACYCLES dial to "0.00".
d. With VTVM measure High Frequency Varactor voltage. (Feed thru C36).
   Adjust CENTERING and SWP BAL controls for +5 V.
e. Connect RF OUTPUT to a detector and then to the Oscilloscope. Set BLANKING switch to ON.

   Remove Low Freq. buffer transistor (Q10) from its socket.

   Connect a 10 μμf capacitor to the collector pin of Q10 socket and connect utilator output cable to this capacitor. Use short ground lead. Insert 10 DB attenuation in Utilator Set at 70 mcs.

   Tune high freq. sweep oscillator coil so that a birdie appears on the scope indicating that the oscillator is tuned at 70 mcs. If no birdie appears, check oscillator, buffer mixer and output amplifier stages.

   Disconnect Utilator and 10 μμf capacitor and insert transistor in socket.

f. Remove High Frequency buffer transistor (Q9) from its socket.

   Connect 1- μμf capacitor and Utilator to collector pin of socket.

   Set frequency switch to "Add 10 MC"
   Set FREQUENCY MEGACYCLES dial to "9.99".
   Adjust 10 MC ADJ pot for +5 volts on low frequency sweeping oscillator varator, (feed thru C45).

   Set Utilator to 60 mcs. Tune sweeping oscillator to 60 mcs using same procedure as in Step e.

Disconnect Utilator and 10 mf capacitor.
Reinsert transistor into socket.

4.4 SWEEP CIRCUIT BIAS SETTINGS:

A Connect VTVM to slider arm of FREQ. MEGACYCLES potentiometer, (rearmost contact). Use lowest voltmeter scale.

B. Adjust FREQ. MEGACYCLES control so that "zero" volts appears. (Use either READ DIRECT or ADD 10 MC switch position, whichever is necessary to get "zero" volts). Lock Digit Dial so that control will not turn.

C. Set SWEEP WIDTH switch to "20 mcs". Select a value for R46 so that the base voltage of Q6 remains the same as in the 2.0 mc position.

D. Set SWEEP SELECTOR switch to 2.0 mcs. Adjust SWP BAL control so that the collector voltages on each of the differential amplifiers (Q6, Q7), is approx. 26 volts.

4.5 SWEEP WIDTH:

A. Set SWEEP SELECTOR to LINE LOCK
Set SWEEP WIDTH switch to "20 mcs"
Set SWEEP WIDTH control to "max. clockwise."
Set FREQUENCY switch to READ DIRECT.
Set FREQ. MEGACYCLES dial to "9.99" or at the setting which positions the zero beat at the left of the scope trace.

B. Connect Utilator to detector box marker input. Set Utilator to "20 mcs". Birdie should appear at right end of the scope trace.

4.6 SWEEP LINEARITY:

A. Connect RF OUT to sweep input of Harmonic Marker Generator. Connect 2 mc CW Generator to Marker Generator, and connect to scope. Birdie markers will appear at two megacycle intervals along the scope trace. Adjust LINEARITY controls so that each birdie is equally spaced. Use the lines on the scope graticule as a guide. The upper four pots adjust the right half of the trace and the lower four the left half. Ater adjusting the sweep linearity, it may be necessary to readjust the sweep width (R-47).

B. 1) Set FREQUENCY MEGACYCLE dial to 0.00, READ DIRECT.
Set SWEEP SWITCH to "2.0 MC.
Adjust CENTERING control so that "zero" beat appears at center of trace.
Set FREQUENCY MEGACYCLES dial to "9.99".
Adjust 10 MC ADJ control so that the harmonic birdie marker representing 10 mc appears at center of trace.
Track back and forth between "0.00 and 9.99" until frequency dial tracks.

2) Tune the FREQUENCY MEGACYCLES dial thru its range from "0.00 and 9.99", checking the dial readings against the multiples of the 2 mc Harmonic markers. Dial readings should be within approx. ±.250 of correct frequency

3) Swith to ADD 10 MC
Check Frequency dial tracking and accuracy as in Step 2.

4) Set LOG-LIN switch to LOG.

4.7. BLANKING

A. Connect scope vertical to collector of Q11. Set LOG RANGE ADJ TRIMPOT R52 so that the high end (+30 V) of the log sawtooth appears at the right end of the scope trace, so that there is no flattening of the response.

B. Connect scope vertical to the common arm of the log/lin switch connected to the Sweep Width switch. Select a value for resistor R48 so that the amplitude of the sawtooth is equal when switched between LOG & LIN modes.

C. Adjust Log Bias Adj trimpot so that log sawtooth is centered around zero volts.

D. Connect detected output to scope vertical. Using 200 KC absorbtion trap and 2 mc and 20 mc markers. Set Log Adj pots so that distances between 0, 200 KC, 2 MC & 20 MCS are equal.

4.8 AGC AND FLATNESS:

A. With RF OUT connected to the voltage calibrated detector, use the AGC ADJ pot to obtain max. flatness and the RF LEVEL ADJ to set the output at 1.0 volt RMS. Since the AGC ADJ pot also changes the level somewhat, it is necessary to work back and forth between the two pots.

Check RF LEVEL control on rack. It should have approx. 6 DB range.

Check the AGC on both FAST and SLOW speeds. On FAST speed a spike will appear at the right end of the trace. If trouble is encountered in the AGC system, the voltages on the high frequency buffer (Q8), should be checked. The base voltage should be approx. -4 volts for 1 V RMS and -2.8 volts for 0.5 V RMS. The collector current should be 9.5 ma for 1.0 V RMS and 11.5 ma for 0.5 V RMS.

Figures varying greatly from this, indicate that this transistor is operating on the wrong side of its curve.

B. For maximum output flatness, tune C24 High Frequency buffer (Q8) modulator tuning. Also, tune the coils in the output amplifiers. If doubt exists about the proper functioning of the output filter and amplifier sections, they can be checked against the following specs:

For 1 volt RMS undistorted output - input 80 mv p/p, gain -31 DB,
Flatness $\pm$.5 DB 8 kc - 25 mcs.

C. With output set at 1.0 volt, set METER ADJ pot for 1.0 volt reading on Output meter.

Set RF LEVEL control for 6 DB attenuation. Check meter tracking, (it should read approx. 0.5 volts).

4.9 DISTORTION

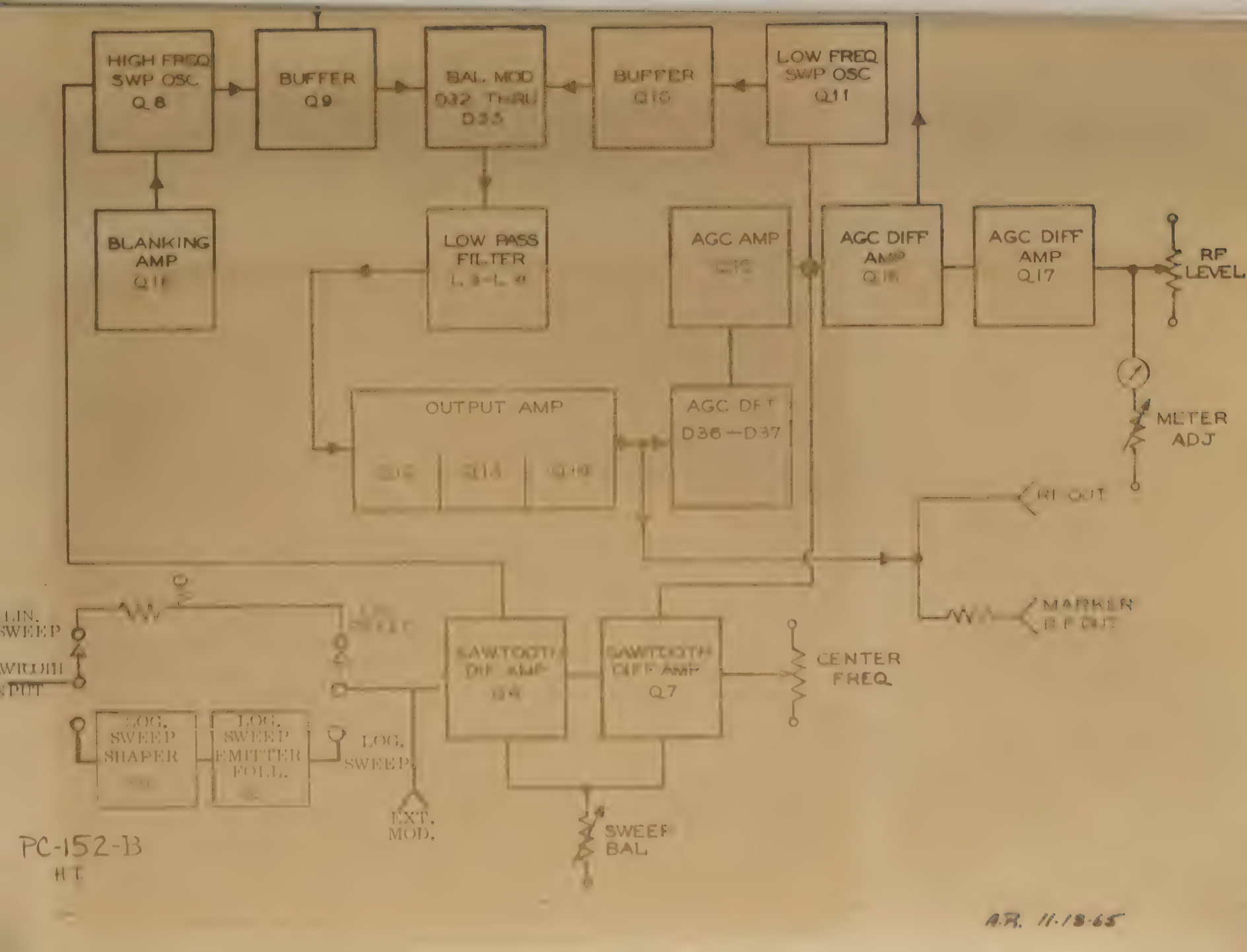
A. Put Cover Shields on oscillator and output amplifier units. Connect RF OUTPUT to 10 kc trap and then to scope vertical input. Insert 10 DB attenuation. Set SWEEP WIDTH switch to 2.0 mcs. Set Rep Rate to approx. 5 cps. Set AGC SPEED to SLOW.

B. Set FREQUENCY MEGACYCLES dial and SWEEP WIDTH pot so that "zero" beat appears at left end of trace and the 10 kc trap appears at approx. center of sweep trace.

C. With scope vertical gain set so that trace covers a large portion of the scope face, check the sweep symmetry. Output sweep trace should be nearly identical on each side of the blanking line. If not, check modulator balance.

D. Switch SWEEP SELECTOR to MAN.

Set SWEEP WIDTH pot for minimum sweep width. Set Scope to internal sweep. Remove 10 kc trap. Check waveform for clean sine-wave from 10 kc up to limit of scope response.



PC-152-13
H T

A.R. 11-18-65

READ DIRECT 70-80 MHz

READ DIRECT 60-70 MHz

LEVEL ADJ

RF LEVEL (EXT)

AGC DIFF AMPL

AGC AMP

HIGH FREQ SWP OSC

BUFFER

BAL ADJ

LOW FREQ SWP OSC

VIDEO AMPL

VIDEO AMPL

EMITTER FOLLOWER

J-1 AUX RF OUT

MARKER RF OUT

J2

J3

RF OUT

BLANKING

SELECT FOR LIN SWP WIDTH

LIN SWP BIAS

LOG BIAS ADJ

LOW END ADJ

LIN ADJ A

LIN ADJ B

LIN ADJ C

LIN ADJ

NAR SWP BIAS

SWP BAL (INT)

SAWTOOTH DIFF AMPL

CENTER'G ADJ (EXT)

ADD 10 MHz ADJ

FREQ MHz

10 MHz ADJ (INT)

117 VAC

NOTE
UNLESS OTHERWISE INDICATED
ALL RESISTANCES ARE IN OHMS ½W (EXCEPT SHIELD SECTION ¼W)
ALL CAPACITANCES ARE IN μμf
ALL FEED THRU CAPACITORS 1000 μμf
* FACTORY SELECTED

USED IN
MARKA-SWP 1500C
VARI-SWP 860H

SCHEMATIC 10 KHz - 20 MHz PC 152B, PC 152C

MAT. FINISH: SCALE:

DIMENSION TOLERANCES UNLESS OTHERWISE SPECIFIED.
DECIMAL DIMENSIONS ± .005 FRACTIONAL DIMENSIONS ± 1/64

CHANGE	DATE	APP.
A* PER ECN #1168	7-68	LH
B IMPROVE INT MKR ECN #1170; BALANCE MIXER ECN #1176	8-68	LH
C HOLE FAT MOD HEAT PER ECN # 1224	9-68	LH
D* PER ECN # 1287	10-68	LH
E* PER ECN # 1314	11-68	LH

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PINE BROOK, N. J.

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APP. BY [illegible] DATE 11-27-67

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